ATOMIC ENERGY newsletter

THE FIRST AND ONLY

ROBERT M. SHERMAN, EDITOR. PUBLISHED BI-WEEKLY BY ATOMIC ENERGY NEWS, INC., 509 FIFTH AVENUE, NEW YORK 17, N. Y.

October 9th, 1951
Vol. 6...No. 4

Dear Sir:

Soviet scientists have now succeeded in exploding another atomic bomb within the Soviet Union, a White House spokesman announced last week in Washington; subsequently, this fact was acknowledged by Premier Stalin, in the newspaper Pravda. It is believed the explosion occurred within the last two weeks. This is the second such atomic blast which Soviet scientists have produced; detection of the first was revealed by President Truman Sept. 23rd, 1949. Since it is possible to detect an atomic explosion thousands of miles away, by purely scientific means, as well as the power, the efficiency, and the type of fissionable material used in the bomb, it is now known that the first Soviet bomb exploded, in 1949, used plutonium, and was equivalent to the now-obsolete Nagasaki-type weapon used by the U.S. in World War II. According to Representative F. Edward Hebert, Louisiana, who witnessed the tests at Eniwetok last Summer, the new U.S. atomic bombs have approximately 2½ times the explosive force of the Nagasaki-type weapon.

Operation of the new uranium-235 production plant, now being built in Paducah, Ky., will be by Union Carbide & Carbon Corp., under an agreement recently entered into between the USAEC and that firm. Carbide now operates, on a fixed-fee cost-reimbursement basis, the three Oak Ridge atomic energy facilities. Under the terms of this new agreement, Carbide will not only staff and operate the Paducah gaseous diffusion plant, but will also perform much of the process design, engineering, and development work there, as well as procurement of special equipment required. This $500 million facility at Paducah is now being built for the USAEC by F. H. McGraw & Co., Hartford, Conn. Carbide's organization for operating the Paducah plant will be headed by C. T. Felbeck, vice-president, in New York, and by Clark E. Center, general manager of Carbide's atomic energy operations in Oak Ridge; the operating personnel at Paducah has been placed at about 1,600.

As predicted by this NEWSLETTER (McMahon resolution for additional atomic funds is a feeler and anticipates a later USAEC request"-AEN-9/25/51, p.1.), Gordon Dean, USAEC chairman, has now stated in Washington that the atomic bomb output of the U.S. can be greatly expanded if it receives "the necessary money and priorities". Dean made this statement at a closed-door session of a Congressional committee hearing. Senator McMahon, Chairman of the Joint Congressional Committee on Atomic Energy, had previously introduced a resolution into Congress urging an increase in U.S. atomic spending from the present $1 billion yearly rate to $6 billion annually. Meanwhile, further support of this large increase came from Secretary of Defense Lovett, and the Joint Chiefs of Staff.

The U. S. Atomic Energy Commission, and the Department of Defense, have now been given the sole right to use priorities in the purchase of chemicals. The order, issued by the National Production Authority in Washington, during the last fortnight, means that all other users must buy chemicals through normal market channels without the help of priorities.

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The Nuclear Propulsion of Aircraft: A special digest of remarks by Dr. Miles C. Everett, aircraft nuclear propulsion project, General Electric Co., before Institute of Aeronautical Sciences, Oct. 4, 1961, Chicago, Ill.

Why fly an aircraft with nuclear power? The answer is that since 1-lb. of uranium-235 will liberate heat, on undergoing fission, equivalent to the energy liberated on burning 1,700,000 pounds of gasoline, converting the energy of nuclear fission into thrust will enable: 1) A nuclear aircraft could fly entirely around the world at local midnight, with the lower vulnerability which such night flying confers. 2) In a nuclear powered aircraft, careful husbanding of fuel, programming of flight speed and altitude, and closely timed flight plans would become unnecessary. 3) Many missions impossible for chemical aircraft would be possible with a nuclear aircraft.

PROPULSION MACHINERY- Practically every type of aircraft propulsion machinery has been proposed: turbine-driven propellers; turbojet; ram-jet; etc. However, in all cases except that of the ram-jet and other direct air cycles, heat must be transported in a coolant from the reactor to the propulsion machinery. This is impracticable, due to the additional shielding needed.

REACTOR-(Note: The initial theoretical studies on this reactor--the key to practical nuclear flight--were made by Fairchild Engine & Aircraft, at Oak Ridge, and were the first approaches to this subject. Presumably, the studies showed that a reactor for aircraft propulsion was feasible, since G-E's Aircraft Gas Turbine Dept., Lockland, Ohio, has an Air Force and USAEC contract to develop the complete nuclear power plant for an aircraft, while Consolidated Vultee, San Diego, has an Air Force contract to build the air frame.)

SHIELD WEIGHT- The shield will be the heaviest single object aboard the aircraft. Early published estimates of shield weight placed the minimum shield at 50 to 100 tons, without any provision for heat removal. Since fuel loads of modern aircraft are in the neighborhood of 75 tons or more, the weight of the shield and the reactor (which replace chemical fuel) are not grossly different from conventional fuel loads.

BALANCE & STRUCTURE- With a large concentrated weight, such as the shield and the reactor, at one point in the aircraft, it will be necessary to redesign the structure of the aircraft to accommodate this weight. Although large aircraft are designed for very large gross weights, this weight is usually distributed over the wing and throughout the fuselage. Concentrating the weight in the fuselage greatly increases wing bending moments, and structural redesign.

FISSIONABLE MATERIAL INVESTMENT- Fissionable material needed includes not only that in the reactor in the aircraft, but the quantities previously removed from the reactor, upon contamination, and which are being chemically processed on the ground, for re-use.

RADIATION DAMAGE- Some liquids or gases, which might be proposed as reactor coolants, are decomposed by radiation, and hence are not usable. Organic compounds are particularly susceptible, and even outside the zone of most intense radiation in the reactor, ordinary lubricants turn tarry or even solidify. Lubricated machinery hence may not be used in such locations. Electrical insulation, on prolonged exposure to radiation, breaks down and disintegrates or loses its effectiveness.

MATERIALS- The combined effects on materials, in a power developing nuclear reactor, of high temperature, corrosion by various coolants, radiation damage, and thermal and mechanical stresses, can be extremely serious in some cases. The aircraft reactor presents these problems to an unusual and critical degree. For example, a difference of 100 deg. F. in permissible maximum reactor temperature can easily produce a 15% difference in thrust output of the power plant. High temperature materials are therefore a prime necessity. A corrosion resistant coating on the reactor heat transfer surfaces a few thousandths inches thick may double the critical mass. An alloy high in nickel may have good corrosion and high temperature strength properties for use as reactor structure, but be so strong a neutron absorber as to be substituted by another alloy of lower nickel content and poorer corrosion and strength properties.

Nuclear Energy and Allied Topics; at the XII International Congress of Pure & Applied Chemistry, Sept. 9-15, 1951, New York

Practical Utilization of Atomic Energy- The average nuclear energy potential in the uranium and thorium of the world's continents is equivalent to 20 to 50 pounds of coal per pound of earth, John J. Grebe, research consultant to Dow Chemical, and participant in high-level USAEC technical studies of nuclear energy explained. He addressed the Section on Industrial and Engineering Chemistry. In some land masses, for example the Alleghany mountain range in the United States, the average is ten times as great. He pointed out that as our nuclear technology advances, energy from atomic fuel will become cheaper than energy from coal. Furthermore, he observed, its universal distribution could make every nation self-sufficient in fuel, and open for useful exploitation mineral deposits now in locations too remote to be economical. For the United States, Grebe foresaw a possible increase of 1% in national productivity solely from anticipated savings in fuel costs. He asserted that mankind ultimately will benefit far more than it will suffer from the practical utilization of the atom.

Atomic Energy; Research & Development- As delivered to the Nuclear Chemical Section. Canada's Chalk River atomic energy installation, and work there, was described by L. G. Cook and F. W. Gilbert. The latter stated that the NRX pile at Chalk River is distinguished among known experimental reactors by its high neutron flux. This neutron flux is about 10 to 20 times that of a graphite reactor of comparable power (10,000 kw.), and is due to the smaller physical size of the NRX reactor made possible by the use of heavy water as a moderator. Dr. Cook outlined the research program at Chalk River, which is dictated largely by the fact that the NRX pile is a heavy water, high flux reactor. Thus, they study neutron cross-section reactions, physical and chemical effects on solids, fundamental work on products of the reactors, as well as counting techniques, vacuum sublimation, and other analytical and extractive methods.

The work at Great Britain's Atomic Energy Research Establishment, Harwell, was listed by F. D. S. Butement, who read a paper prepared by R. Spence of that laboratory. This work includes (he stated) the production of isotopes, effect of temperature on magnetic susceptibility of plutonium, study of methods for the separation and analysis of fission products, and the preparation of carbon-14 labeled organic compounds for use in further synthesis.

The objectives of the United States involve pursuing two goals of development, Kenneth S. Pitzer, former USAEC research director, explained. As the military objectives, he listed improved weapons, and power sources for military needs such as ship propulsion reactors and aircraft propulsion reactors. Civilian objectives are producing large power reactor installations. Serious problems are those of finding and producing cheaply materials which have both desirable nuclear properties and the necessary structural and thermal properties to make fuel systems and structural parts of an efficient reactor.

The low power, so-called water boiler nuclear reactor, now under construction at North Carolina State College, may be the answer to the needs of educational institutions and private research organizations according to Clifford K. Beck, of the college. He stated that such a reactor can be built for under $100,000 in cluding instrumentation, but exclusive of the building to house the reactor. Such a reactor would operate at 10 or 20 kw. power output. One advantage of this type of reactor is that the neutron flux can be separated into various narrow band energies. Chemical problems that could be attacked with this type of reactor, Dr. Beck said, are decomposition of molecules, polymerization studies, activation analyses, initiation of Szilard processes, and structure by neutron diffraction methods.

Advances in the use of radioisotopes were reviewed by P. C. Aebersold, Isotopes Division, USAEC. Today there are available a variety of isotopes from stock as well as those available to special specifications as to type or irradiation desired. In addition, pile facilities are available for activation analyses.

NEW PRODUCTS, PROCESSES, & INSTRUMENTS...for nuclear work...

New TGC-16 industrial gamma tube is a stainless steel tube especially designed for industrial process control procedures using gamma rays, as well as for cosmic ray counting. Said by manufacturer to be suitable for installations which require ruggedness and good response over a considerable temperature range, such as oil pipe line inspection and liquid level gauges. Features of this new tube include the absence of any flanges, bases, and base pins; a wall thickness of approximately 400 mg/sq. cm.; a starting potential of 870-930 volts; and a minimum plateau length of 200 volts with a slope of approximately 1% per 100 volts. Fill gas used is helium with an organic quench, and the tube has a recovery time of approximately 200 microseconds. Supplied with a standard sensitive length of 12 inches, the overall dimensions of the standard tube are 15¼" x 1" O. D.--Tracerlab, Inc., Boston 10, Mass.

New lightweight radiation probe, for detecting and measuring alpha, beta, gamma, and neutron radiation is designed for use in hospitals, and industrial and university laboratories where work with radioactive materials is being conducted. This new probe, which is a scintillation-type instrument, comprises a phosphor, photo-multiplier tube, and a two-stage amplifier with low impedance output. The phosphors, incorporated into specially designed caps placed on the end of the probe, can be easily replaced, should the need arise, the manufacturer states, and the detecting heads can be quickly inter-changed. The neutron cap alone, adapted to measure beams of thermal neutrons, is expected to have wide application in general health physics work, it is said. The complete detector is 2 3/8 inches in diameter, 15 inches long, and weighs approximately 10 pounds.--General Electric Co., Special Products Div., Schenectady, N.Y.

Notes- Catalog "C", of Tracerlab, Inc., Boston 10, Mass., manufacturer of nucleonic products, has now been issued; the full line of this firm is included in this 107 page catalog.

IONIZING RADIATION...investigations & notes....

In the course of attempting to find practical industrial uses for gross fission products, the University of Michigan's Engineering Research Institute has irradiated foodstuffs to determine the bacteria killing ability of ionizing radiation. Source of the ionizing radiation used in the experiment was radiocobalt (cobalt-60) which had been prepared in the Brookhaven National Laboratory nuclear reactor. Samples of homogenized pasteurized milk were exposed to the radioactive source for periods of twenty-four and forty hours. After three weeks of storage at 77 deg. F., (then, sealed in plastic bags to prevent contamination by normal atmospheric bacteria) the samples showed no change in appearance, with the exception of a slightly creamier color. Non-irradiated milk, also kept in plastic bags, soured within twenty-four hours. Bacteriological analysis showed that the high bacteria count of the milk, prior to irradiation, was reduced to zero after the samples had been subjected to rays from cobalt-60. Samples of beefsteak, exposed to the gamma rays from the radiocobalt, were free from putrid odor or surface changes three weeks after irradiation, but non-irradiated meat samples began to decay rapidly after forty-eight hours at the 77 deg. F. temperature. The experimenters have observed that, still to be determined, is whether the irradiation affects flavor or nutritional values.

A suggestion that blood plasma might be more efficiently sterilized with high-energy electrons, than the presently-used ultraviolet radiation, was recently made by Dr. Ernest E. Charlton, before a medical group. Dr. Charlton heads the X-ray section of the General Electric laboratory, Schenectady, N.Y. However, laboratory work is necessary before it can be determined whether or not cathode ray treatment of blood plasma causes any undesirable effects. Using a modified million volt X-ray machine, operating at about 900,000 volts, meat, fresh beans, grains, blueberries, strawberries, peaches, raisins, bread and honey have been sterilized at the G-E laboratory, Dr. Charlton stated. He explained that wrapped bread, which was exposed to the cathode rays, has been kept for many months at room temperature without becoming moldy and has retained a fresh bread odor.

RAW MATERIALS...radioactive minerals for nuclear work

UNITED STATES- Moab, Utah: Five uranium mines in the Colorado Plateau area have recently been certified as eligible for bonus payments for ore shipped to the USAEC. Purpose of the bonus is to encourage development of new mines. The mines certified (according to Frank McPherson, manager of the Colorado raw materials office of the USAEC) are: 1) The Big Maverick and Arrowhead, in the Calamity mining district, Mesa county, Colorado; operator, Dan E. Kelley. 2) The Morning Star and Evening Star claims in Montrose county; operator, J. W. Gramlich. 3) The Socko No. 2 and Little Eva claims in the Yellow Cat mining district of Grand County, Utah; operator, Loyal A. Sutherland. 4) The Black Ape 1 and 2, and Lucky Day mining claims, in the Yellow Cat district; operator, Eli Malich. 5) The Vanadium Queen mining claim in the La Sal district of San Juan county; operator, Abe Day.

As an example of the amount which might be claimed under this bonus program, a mine delivering 0.20% uranium oxide per ton of mined ore would be eligible for a payment of $3.50 per pound additional, which is the maximum bonus allowable. Because 0.20% ore contains four pounds of uranium oxide in each ton, the operator would receive $14 per ton as a bonus. This is added to the regular buying price of $14 per ton paid by the USAEC, plus the development allowance of $2 for this grade ore. Hence, the total price would be $30 per ton, for the tonnage in which the first 10,000 pounds of uranium oxide is produced from any mine, i.e., the first 2,500 tons of 0.20% ore. The operator could then expect a price of $75,000 altogether under this plan, or $34,000 as bonus alone. (Miners are paid only on the first 10,000 pounds of contained uranium oxide in ore assaying 0.10% or more and which has been shipped from the mine since Mar. 1st, 1951. These "incentive payments" apply only to the low-grade Colorado Plateau uranium ores.)

CANADA- Exploration on the Lake Athabaska area properties of Urvan Mines, and Nyberg Uranium, has been in progress since early in July, the annual meeting of Nisto Mines was told. Nisto participated with Transcontinental Resources and Consolidated Nicholson Mines in optioning the two groups, and in formation of the new companies. Work was concentrated on the Urvan ground, where diamond drilling is starting. While no definite idea of values has been secured as yet, an earlier report said the most important showing has an indicated length on surface of 300 ft., a width of 5.8 ft., and a grade of 0.67% uranium oxide and 1.33% vanadium oxide.

An immediate start on underground exploration at its property in the Beaverlodge Lake area of northwestern Saskatchewan has been announced by Beaverlodge Uranium Mines, Ltd. The program will continue through the Winter. James Mackee, president, stated that a contract has been let for 3,500 ft. of diamond drilling. (Of the 1,525,000 issued shares of Beaverlodge Uranium stock, 225,000 shares are owned by Western Uranium Cobalt Mines, Ltd.)

CHILE- Chilean and American (USAEC) geologists have found uranium minerals in copper tailings and wastes of other mines at Tambillos, in Coquimbo Province, in central Chile, a spokesman of the Chilean government announced in Santiago last week. The geologist's report added that radioactivity also was discovered farther north in the province of Atacama.

MOROCCO- The director of industrial production, Colonel Pommerie, reported last week that uranium minerals had been discovered in the South Atlas mountains at Bouazzer and Azegour. While the mineral at Bouazzer was in a complex form that would make exploitation difficult, at Azegour it was in the form of pitchblende, he stated.

BRAZIL- Plans for prospecting in Brazil for uranium and allied minerals, under the Department of Mineral Production, now embrace three main regions: 1) the pegmatite zone of Northeast Brazil, which includes the known occurrences of beryllium and lithium, situated in Rio Grande do Norte, Paraiba, and the adjoining States; 2) the costal belt of Bahia, Espirito Santa, and Rio de Janeiro, particularly the monazite reserves of beaches, river banks, and submarine platform; and 3) the extensive chain of known deposits of heavy minerals in Minas Geraes. (The president of the National Research Council, which controls Brazil's atomic energy activities, stated last August that Brazil's first atomic pile will be erected in Minas Geraes.)

ATOMIC PATENT DIGEST...latest U. S. applications & grants...

GRANTS-Apparatus for the measurement of radioactivity. Assay apparatus comprising a cage, a lead house arranged in this cage, an auxiliary lead compartment within said lead house, a source of penetrating radiation, and a movable element for moving this source between an operative position in the lead house and a safety position in the compartment. U. S. Pat. No. 2,567,668, issued Sept. 11, 1951; assigned to United States of America (USAEC).

Fluorination of high molecular compounds. The method of preparing a highly fluorinated high molecular product, which comprises passing a mixture of vapor of a high-boiling hydrocarbon oil, and a larger volume of vapor of hydrogen fluoride, into contact with a fluorinating agent of the group consisting of cobalt trifluoride, silver difluoride, and manganese trifluoride, at a temperature between 150 deg. C., and 400 deg. C. U. S. Pat. No. 2,567,759, issued Sept. 11, 1951; assigned to United States of America (USAEC).

High-pressure polymerization of perhaloolefins. A method of preparing a high molecular weight polymer of a compound of 2 to 4 carbon atoms selected from the group consisting of olefinic compounds of carbon and fluorine and olefinic compounds of carbon, fluorine and chlorine which comprises subjecting said compounds to a pressure in the range of 10,000 to 20,000 kilograms per square centimeter. U. S. Pat. No. 2,567,956, issued Sept. 18, 1951; assigned to United States of America (USAEC).

Rotary shaft driven tappet. A tappet driven by the rotation of a shaft to operate a device a short time from the instant the shaft is at a dead stop. Comprises, in combination, a sleeve bearing carried on said shaft, and freely rotatable thereabout; a pair of arms mounted rigidly on opposite sides of these bearings; means for transmitting the torque developed by the rotation of said shaft to said bearing; a stop to limit the rotary movement of said bearing to less than one revolution; a damper for smoothing the movement of said bearing; and means for transmitting the movement of said bearing to said device. U. S. Pat. No. 2,568,061, issued Sept. 18, 1951; assigned to United States of America (USAEC).

Method of making a highly pure dodecafluoroheptene fraction suitable for use in the manufacture of chlorine-free perfluoroheptane from a mixture of polychlorinated heptanes containing between 10 and 12 chlorine atoms per molecule. U. S. Pat. No. 2,568,642, issued Sept. 18, 1951; assigned to United States of America (USAEC).

Fluorination process. Completely fluorinating a hydrocarbon by utilizing finely divided cobalt trifluoride in a closed chamber reaction with hydrocarbon vapors. U. S. Pat. No. 2,568,660, issued Sept. 18, 1951; assigned to United States of America (USAEC).

Method of forming uranium monocarbide. A process for producing uranium monocarbide, comprising reacting a mixture of uranium plus carbon and a mixture of uranium, uranium carbide, by heating the mixture to a temperature sufficient to bring about reaction, but below the melting point of metallic uranium, and maintaining said temperature for reaction and formation of uranium monocarbide. U. S. Pat. No. 2,569,225, issued Sept. 25, 1951; assigned to United States of America (USAEC).

Filter. In an automatic stabilizing circuit for a mass spectrometer whose accelerating anode has a D.C. and an A. C. voltage impressed thereon, means for detecting the phase of the signal at the collector plate of said mass spectrometer, and means responsive to the output of said phase detecting means for controlling the accelerating anode D. C. voltage. U. S. Pat. No. 2,569,232, issued Sept. 25, 1951; assigned to United States of America (USAEC).

Sincerely,

The Staff,
ATOMIC ENERGY NEWSLETTER

October 9th, 1951